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COLORECTAL CARCINOMA — A NEW THREAT TO BLACK PATIENTS? A RETROSPECTIVE ANALYSIS OF COLORECTAL CARCINOMA RECEIVED BY THE INSTITUTE FOR PATHOLOGY, UNIVERSITY OF PRETORIA

N Angelo, L Dreyer

Objective. To compare black and white patients with colorectal carcinoma treated at Pretoria Academic and Kalafong hospitals, and to compare pathological trends of our study population with others reported in the literature.

Design. A retrospective study of all cases of resected colorectal carcinomas received by our department during the periods 1986 - 1987 (82 cases) and 1996 - 1997 (91 cases). To investigate variables of age, race and gender distribution in the two study populations.

Methods. Routinely stained histological sections of all relevant cases were examined. Findings regarding age, gender, population group, anatomical location of the tumour and presence of other pathological lesions were recorded. Changes in the referral population and number of surgical specimens received were also considered during statistical analysis of the study findings.

Results. There has been a significant increase in the number of black patients with colorectal carcinoma at our Institute. In addition, adenomatous polyps were found in 9 of our black patients (1996/97). This is significantly higher than expected from reports in the literature. This could be predictive of an increase in incidence of colorectal carcinomas in our black population. Black patients were also found to be considerably younger at age of presentation than their white counterparts. A further significant finding was a considerable increase in the number of black females under the age of 40 years from 1986/87 to 1996/97. On the other hand, the number of white females above 40 years of age decreased considerably over this time. The reason for this finding is uncertain and warrants further study.

Department of Anatomical Pathology, Institute for Pathology, University of Pretoria

N Angelo, MB ChB, DA (UK)

L Dreyer, MB ChB, MMed (Path), MD

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SAMJ

Colorectal carcinoma is a major cause of morbidity and mortality in developed countries. It is generally accepted that the disease is uncommon in undeveloped countries. The incidence is low in Asia, South and Central America and all of Africa, except Egypt.[1,2]

It is well established that migrants to a particular geographical area assume the colon cancer risk of that area. The geographical variation strongly suggests that environmental factors or change in lifestyle play an important role in the development of colorectal carcinoma.[1,3-5]

Despite major changes in lifestyle and dietary habits, colorectal carcinoma and adenomatous polyps are still uncommon in black patients.[6-9] Colonoscopic findings differ greatly between whites and blacks, with diverticular disease, polyps and carcinoma being far more common in whites than blacks.[8] In 1995 Degiannis et al.[10] found colorectal carcinoma to be uncommon among black South Africans living in Soweto, although a stepladder increase in the frequency of colorectal polyps was described from the disadvantaged to the more westernised communities.[10]

In 1970, Bremner and Ackerman[1] found no adenomatous polyps in 14 000 autopsies done on black patients. Similarly, 13 073 autopsies performed at Mpilo Central Hospital in then Rhodesia found no polyps in the colon and rectum, nor were polyps associated with colorectal carcinoma. During a 12-year period (1956 - 1968) at Baragwanath Hospital, Johannesburg, only 6 adenomas were submitted for histological examination.[1] A later report[11] from Mpilo Hospital covering the period 1980 - 1987 supported the findings that these conditions were uncommon in blacks. Ninety patients were treated for colorectal carcinoma during this time at an average of 11.25 new cases per year. Of 40 619 surgical admissions, this amounted to 0.22% of cases.[11]

The literature reports that patients with colorectal cancer are about 10 years younger in Africa than their counterparts in Europe.[9,12] In a comparative study of proliferative activity of colonic mucosa, the mean age of African patients with adenocarcinoma was markedly lower than that of Europeans (48.6 years v. 66.4 years).[13]

Regarding risk factors, most studies show an association between colorectal cancer risk and dietary fat and meat.[2,9] Fish, fruit and vegetable consumption is protective. Among South African blacks, inhibitory factors outweigh promotive factors for adenoma formation. The factors thought to inhibit adenoma formation are carbohydrate malabsorption, low dietary fat intake, lower cell proliferation index, higher levels of faecal short-chain fatty acids, lower faecal pH values and differences in colonic microflora.[7,9]

The aim of this study, therefore, was to compare black and white patients treated at the Pretoria Academic and Kalafong hospitals, and to compare pathological trends of our study population with others reported in the literature.

MATERIALS AND METHODS

A retrospective study was undertaken of all cases of resected colorectal carcinomas received by our department during the 2-year periods 1986 - 1987 and 1996 - 1997. Variables of age, race and gender distribution were compared across the two study populations. The 1986/87 period included 82 patients and the 1996/97 period 91 cases.

All available routinely stained (haematoxylin and eosin) histological sections were studied by light microscopy to determine the histological type and associated pathology. Tumours were divided into four different groups, namely conventional adenocarcinoma, colloid carcinoma, signet ring-cell carcinoma and mixed-type adenocarcinoma. Conventional adenocarcinomas were defined by the presence of glandular structures with or without areas of solid growth. Tumours with 60% or more extracellular mucin were labelled colloid carcinoma, and those with 60% or more intracellular mucin, as signet ring-cell carcinoma. Two tumours were found to have even representation of all three of these types, and were therefore termed mixed-type adenocarcinoma.

After histological typing, the patients' medical records were studied to determine age, race, gender and anatomical distribution of the primary tumour.

Data on the reference population were obtained by sampling 100 consecutive surgical specimens, received at the Institute, at 6-monthly intervals over the study periods 1986/87 and 1996/97. These data and the total number of surgical specimens received in 1986/87 (22 617) and 1996/97 (26 022) were used to adjust the observed cases of 1986/87 to anticipated cases in 1996/97. Observed cases in 1996/97 were then compared with the anticipated values for 'goodness of fit' (Table I). Cases were divided into groups of race, gender and age (≤ 40 years and > 40 years) for statistical comparison.

RESULTS

Age, gender and population group

The relevant findings are depicted in Tables II and III. In 1986/87, black males developed carcinoma 30 years earlier than their white counterparts. The difference decreased to 17 years in 1996/97. Black females were 10 years younger than white females in both study periods.

Histological type

Histological types found in the different groups were fairly similar and are reflected in Table IV. There were no adenomatous polyps in black patients in the 1986/87 period, whereas 9 cases were found in 1996/97. Two white patients had adenomatous polyps in 1986/87, and 12 in 1996/97.

Table I. Analysis of study population and observed cases by race, gender and age

Gender, race and age (yrs)	Population distribution (N) 1986/87	Population distribution (N) 1996/97	Cases 1986/87 (N)	Expected cases 1996/97 (N) (corrected for population and specimens)*	Observed cases 1996/97 (N)	Expected values for goodness of fit	Contribution to χ^2
Black males							
> 40	42	55	4	6.02	10	7.25	1.043
≤ 40	42	45	4	4.93	7	5.94	0.189
Black females							
> 40	42	74	8	16.21	22	19.52	0.315
≤ 40	63	79	1	1.44	4	1.73	2.979
White males							
> 40	56	47	17	16.41	22	19.76	0.254
≤ 40	34	23	0	–	1	–	.–
White females							
> 40	80	44	47	29.73	25	35.81	3.263
≤ 40	35	25	1	0.82	0	0.99	0.99
χ^2							9.003†

* (Population 1996/97 ÷ population 1986/87) × cases 1986/87 × (26 022/22 617)
† $\chi^2_{0.05,6}$ = 12.592, therefore $P > 0.05$.

Table II. Race and gender distribution of patients with colorectal carcinoma

	Blacks (N) 1986/87	Blacks (N) 1996/97	Whites (N) 1986/87	Whites (N) 1996/97	Total (N) 1986/87	Total (N) 1996/97
Males	8	17	17	23	25	40
Females	9	26	48	25	57	51
Total	17	43	65	48	82	91

Location

In 1996/97, colorectal carcinoma in blacks occurred mainly in the ascending colon, whereas in whites it was more common in the descending colon (Table V). The chi-square test was performed on these data, and found to be marginally not statistically significant ($P = 0.08$). There was no significant difference between location in males and females ($P = 0.37$).

Unfortunately, 17 of the 82 cases in 1986/87 were of unspecified location. These data could therefore not be compared with those of 1996/97, and could also not be added to the 1996/97 data to determine whether statistical significance could be obtained by increasing the size of the study population.

Analysis of study population and observed cases

In order to compare findings in the two study periods, the number of surgical specimens received and changes in the referral population were considered (Table I). The figures quoted in the column 'Population distribution', were obtained from 6-monthly samples of referred cases, as discussed in the 'Materials and methods' section. In total, 22 617 surgical specimens were received in 1986/87, and 26 022 in 1996/97. An age of 40 years was arbitrarily selected as a cut-off point.

During calculation, small cell frequencies were found (Table I, 'Expected cases 1996/97'), especially in the under-40 age groups. Although the overall χ^2 value was not found to be statistically significant, the contribution of each cell to the χ^2 was used to interpret the test results.

The observed cases in 1996/97 were compared with the anticipated values for 'goodness of fit', by calculating the overall χ^2 with 6 degrees of freedom ($\chi^2_{0.05,6}$ = 12.592 > 9.033, therefore $P > 0.05$). White males 40 years and younger were omitted from the equation because there were no observed cases in 1986/87.

A significant finding was a considerable increase in the number of black females under 40 years of age from 1986/87 to

Table III. Age distribution according to race and gender for patients with colorectal carcinoma

	Black males 1986/87	Black males 1996/97	Black females 1986/87	Black females 1996/97	White males 1986/87	White males 1996/97	White females 1986/87	White females 1996/97
Age range (yrs)	16 - 63	24 - 77	21 - 81	35 - 80	50 - 85	18 - 84	40 - 84	41 - 89
Mean (yrs)	39	42	58	53	70	69	69	69
Average (yrs)	38.4	46.2	60.6	56	69.9	63.3	69.5	66.7

Table IV. Histological types of colorectal carcinoma

	Black males (N)		Black females (N)		White males (N)		White females (N)		Total (N)	
	1986/87	1996/97	1986/87	1996/97	1986/87	1996/97	1986/87	1996/97	1986/87	1996/97
Adeno-carcinoma	5	14	9	22	17	20	49	22	80	78
Colloid carcinoma	1	2		2		3	1	3	2	10
Signet ring-cell carcinoma				1						1
Mixed-type carcinoma		1		1						2
Associated adenomas		4		5	1	5	1	7	2	21

Table V. Anatomical distribution of colorectal carcinomas, 1996/97 (figure in brackets as a percentage of subtotal)

	Black males		Black females		White males		White females		Total	
Ascending colon	8	(47)	10	(38.4)	3	(13)	7	(28)	28	(30.7)
Transverse colon	2	(11.7)	1	(3.8)	2	(8.6)	1	(4)	6	(6.6)
Descending colon	4	(23.5)	7	(26.9)	10	(43.4)	12	(48)	33	(36.2)
Rectum/anus	3	(17.6)	8	(30.7)	8	(34.7)	5	(20)	24	(26.4)
Subtotal	17	(100)	26	(100)	23	(100)	25	(100)	91	(100)

1996/97, while the number of white females above 40 years decreased considerably during this time. The reason for this finding is uncertain.

DISCUSSION

The literature on colorectal carcinoma[1-3,7,8,10] reports that: (i) adenomatous polyps and colorectal carcinomas are infrequent findings in black patients; (ii) there is an increase in the incidence of colorectal carcinoma in blacks resulting from adoption of a westernised lifestyle and diet; and (iii) in general, black patients with colorectal carcinoma are 10 - 20 years younger than their white counterparts.

This study does not determine the incidence of colorectal carcinoma among the different population groups, but the disease was not an uncommon finding in our black patients. It was also found that the increase in the number of black patients was more than expected when adjusted for number of specimens and changes in population from the 1986/87 figures.

A significant finding was a considerable increase in the number of black females under the age of 40 years from 1986/87 to 1996/97. On the other hand, the white females above 40 years of age decreased considerably during this period. The reason for this finding is uncertain, and warrants further study.

Also of note, is the finding of 9 cases of adenomatous polyps among the 43 black patients included in 1996/97. This is fairly similar to the white population (12 adenomas in 48 patients), and significantly higher than expected from reports in the literature.[1,7,8,11] There is also a marked difference between the frequency of adenomas in 1986/87 compared with 1996/97. This could be predictive of an increase in the incidence of colorectal carcinomas among our black population.

Regarding age distribution, our findings support others[7,9,10,12,13] that black patients are younger at onset of disease than whites. The difference between black and white males was, however, much smaller in 1996/97 (17 years) than in 1986/87 (30 years). Black females were 11 years younger than white females in 1986/87, and 16 years younger in 1996/97.

This study did not prove significant differences between the anatomical location of tumours in blacks and whites ($P = 0.08$). However, in black patients the tumours were mainly on the right side of the colon, and in whites they were more commonly on the left side. Statistical significance may have been obtained by enlarging the study population. The 1986/87 cases could not be added to the 1996/97 cases because of insufficient clinical information on the location of the tumours.

There was also no difference in the histological types of carcinoma in the different population and gender groups. Further studies, including molecular analysis, may be needed to prove differences in the biology of the tumours in the different population groups.

We thank Dr P J Becker of the Medical Research Council for statistical analysis of the study material.

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DOSE-AREA PRODUCT MEASUREMENTS DURING BARIUM ENEMA RADIOGRAPH EXAMINATIONS — A WESTERN CAPE STUDY

P C Engel-Hills, E R Hering

The aim of this study was to obtain a direct measurement of the typical dose delivered to an average adult patient during a barium enema examination. Measurement was done on a a sample of 50 patients at three departments, using a dose-area product (DAP) meter. The comparison of the results with UK median levels indicates that the doses measured in South Africa are higher (41 Gy cm^2 (dose × area) v. 48 Gy cm^2). Patient protection can be improved by comparing local practice with national reference levels. The values obtained in this study (first quartile 35 Gy cm^2, median 48 Gy cm^2, third quartile 84 Gy cm^2) are recommended as initial reference dose levels for barium enemas in South Africa.

S Afr Med J 2001; **91**: 693-696.

The barium enema is the radiological examination of choice if disease of the large bowel is suspected[1] and as such is a relatively frequent procedure in any radiology department. The barium enema allows for the physical examination of the entire colon and rectum and is minimally invasive. When performed with care this examination will provide satisfactory sensitivity and specificity for the detection of carcinoma and adenomatous polyps of more than a few millimetres in size.[2] The barium enema is a complex investigation, considered to be a high-dose procedure of significance when considering radiation dose to the patient or the population.[3]

The objective of this study was to obtain a direct measurement of the typical dose delivered to an average adult patient during a barium enema examination. Direct dose

Radiography Education, Peninsula Technikon, Groote Schuur Hospital, Cape Town
P C Engel-Hills, MSc

Medical Physics, Groote Schuur Hospital, Cape Town
E R Hering, PhD